

REMARKS

Claims 1, 2 and 4-16 are pending. No new matter has been added by way of the present amendment. For instance, claim 1 has been amended to recite the thickness of the seed layer as supported by the present specification at page 6, lines 8-9. New claim 6 is supported by the present specification at page 5, lines 28-29. New claim 7 is supported by the present specification at page 5, lines 30-35. New claim 8 is supported by the present specification at page 6, lines 1-5. New claim 9 is supported by the present specification at page 5, line 35 to page 6, line 1. New claim 10 is supported by the present specification at page 8, lines 17-20. New claim 11 is supported by the present specification at page 6, lines 13-16, page 6, lines 27-31 and page 7, lines 5-10 and page 7, lines 20-24. New claim 12 is supported by the present specification at page 6, lines 8-9. New claim 13 is supported by the present specification at page 5, lines 23-29. New claims 14 and 15 are supported by the present specification at 8, lines 17-22. Lastly, new claim 16 is supported by the present specification at page 7, lines 31-33. Accordingly, no new matter has been added.

In view of the following remarks Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims.

Issues Under 35 U.S.C. §102(b)

The Examiner has rejected claims 1-5 under 35 U.S.C. §102(b) as being anticipated by Alpay, USP 5,230,971 (hereinafter referred to as Alpay) or Mitsui, USP 5,955,223 (hereinafter referred to as Mitsui) or Shinkai, USP 4,720,442 (hereinafter referred to as Shinkai). Applicants respectfully traverse these rejections.

The Present Invention

The present invention provides a high-performance photomask blank and photomask having a sufficient uniformity of film quality to accept high-sensitivity detection for defect inspection and circuit pattern inspection and capable of accurately forming a desired micropattern without distortion.

The present photomask blank or photomask comprises a transparent substrate, at least one layer of light-shielding film and at least one layer of antireflective film both on the substrate. It has been found that when a seed layer is formed between the transparent substrate and the light-shielding film or the antireflective film, the light-shielding film or the antireflective film is improved in surface flatness (or more correctly "roughness or smoothness") whereby a photomask blank or photomask having uniformity of film quality is obtained.

The surface roughness cannot be improved if a light-shielding film or an anti-reflection film is directly formed on a transparent substrate. This is clearly illustrated by Examples

and Comparative Examples of the present specification a photomask blank formed with a seed layer has a low surface roughness of 0.395 nm (Example 1) or 0.382 nm (Example 2). However, a photomask blank formed without a seed layer has a rough surface of 1.446 nm (Comparative Example 1) or 1.440 nm (Comparative Example 2).

On a defect inspection for a photomask blank, a rough surface causes irregular reflection for detection lights, leading to degraded detection sensitivity. A photomask blank having a low surface roughness has the advantage of detecting defects on the surface, and such a photomask blank can provide a photomask having fine and precise mask patterns.

Distinctions Between the Present Invention and Alpay

Alpay discloses a process for making a photomask blank which comprises a transparent substrate and a masking layer on one surface of the substrate, said masking layer comprising strata of predetermined thickness and composition, the composition of the masking layer changing gradually from the composition of one stratum to the composition of the next stratum.

However, Alpay fails to suggest or disclose the formation of the inventive seed layer having a thin thickness for improving surface roughness. Alpay also fails to disclose the surface roughness of the light semi-transmitting film.

Accordingly, no anticipation based upon Alpay exists.

Reconsideration and withdrawal of this rejection is respectfully requested.

Distinctions Between the Present Invention and Mitsui

Mitsui discloses a phase-shift mask blank having a light semi-transmitting film which contains a transition metal, silicon and nitrogen as the main components on a transparent substrate. The light semi-transmitting film contains 5 to 70 at % of nitrogen and the light semi-transmitting film has a surface center-line average roughness of 0.1 to 10 nm Ra.

The light semi-transmitting film containing transition metal and silicon is different from the light-shielding film and the antireflective film formed of a chromium material containing at least of oxygen, nitrogen and carbon according to the present invention. ~~The light semi-transmitting film also differs from~~ the present seed layer formed of a chromium material containing at least one of oxygen, nitrogen and carbon. Mitsui also fails to disclose and teach the formation of the inventive thin seed layer.

Accordingly, no anticipation based upon Mitsui exists. Reconsideration and withdrawal of this rejection are respectfully requested.

Distinctions Between the Present Invention and Shinkai

Shinkai discloses a photomask blank comprising a transparent substrate, a nitrogen-containing chromium layer as an underlayer, a chromium masking layer, and an antireflection layer. The under layer has a thickness of from 50 to 300 Å to minimize the undercut (the formation of overhang due to etching). Shinkai also discloses a photomask blank comprising a transparent substrate, an antireflection layer, a chromium masking layer, and another antireflection layer. In this mode, the antireflection layer must have a thickness providing to non- or low-reflection (i.e. $1/4\lambda$), thus it requires a large thickness such as 150 to 500 Å.

Shinkai also fails to disclose and teach the inventive thin seed layer for improving the surface roughness. Shinkai further fails to disclose or suggest the subject matter of newly added claims 6-9.

Accordingly, no anticipation exists based upon Shinkai. Reconsideration and withdrawal of this rejection are respectfully requested.

In view of the above, Applicants respectfully submit that the Examiner has failed to present references which anticipate the presently pending claims. Accordingly, Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims.


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If the Examiner has any questions or comments, please contact Craig A. McRobbie, Registration No. 42,874 at the offices of Birch, Stewart, Kolasch & Birch, LLP.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under § 1.17; particularly, extension of time fees.

Respectfully submitted,

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